

CLAIMS:

1        1.        A method for ablating tissue in or around the heart comprising:  
5              introducing into the heart the distal end of a catheter, wherein the catheter includes a  
needle electrode at its distal end;

10              introducing a distal end of the needle electrode into the tissue;  
infusing an electrically-conductive fluid through the needle electrode and into the  
tissue; and

15              ablating the tissue after and/or during introduction of the fluid into the tissue, whereby  
the fluid conducts ablation energy within the tissue to create a larger lesion than would be  
created without the introduction of the fluid.

20        2.        The method according to claim 1, wherein the tissue is ablated using the  
needle electrode.

25        3.        The method according to claim 2, wherein radio frequency energy is delivered  
to the needle electrode for the ablation.

30        4.        The method according to claim 1, wherein the tissue is ablated using a tip  
electrode on the distal end of the catheter.

35        5.        The method according to claim 1, wherein a portion of the needle electrode  
that is introduced into the tissue has an insulating coating.

30        6.        The method according to claim 5, wherein the insulating coating is over a  
portion of the needle electrode that is in contact with the endocardial surface of the tissue  
being ablated.

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7.       The method according to claim 1, wherein the needle electrode comprises nitinol.

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8.       The method according to claim 1, wherein the needle electrode is introduced to a depth ranging from about 2 to about 30 mm.

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9.       The method according to claim 1, wherein the needle electrode is introduced to a depth ranging from about 4 to about 10 mm.

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10.      The method according to claim 1, wherein the needle electrode is introduced to a depth ranging from about 2 to about 30 mm.

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11.      The method according to claim 1, wherein the needle electrode is introduced to a depth ranging from about 5 to about 7 mm.

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12.      The method according to claim 1, wherein fluid is infused through the needle electrode during ablation.

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13.      The method according to claim 1, wherein fluid is infused through the needle electrode before ablation.

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14.      The method according to claim 1, wherein fluid is infused through the needle electrode before and during ablation.

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15.      The method according to claim 1, wherein the fluid infused through the needle electrode comprises saline having a salt content ranging from about 0.3 to about 4 wt%,.

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5           16.     The method according to claim 1, wherein the fluid infused through the needle electrode comprises saline having a salt content ranging from about 0.5 to about 3 wt%.

10          17.     The method according to claim 1, wherein the fluid infused through the needle electrode comprises saline having a salt content ranging from about 0.9 to about 2.5 wt%.

15          18.     The method according to claim 1, wherein the fluid infused through the needle electrode comprises saline having a salt content ranging from about 1.5 to about 2 wt%.

15          19.     The method according to claim 1, wherein the fluid infused through the needle electrode comprises a radiographic contrast agent.

20          20.     The method according to claim 1, wherein the amount of contrast agent present in the fluid ranges from about 5 to about 50%.

25          21.     The method according to claim 1, wherein the amount of contrast agent present in the fluid ranges from about 10 to about 30%.

25          22.     The method according to claim 1, wherein the amount of contrast agent present in the fluid ranges from about 10 to about 20%.

30          23.     The method according to claim 1, wherein the fluid is infused through the needle electrode a rate ranging from about 0.3 to about 5 ml/min.

30          24.     The method according to claim 1, wherein the fluid is infused through the needle electrode a rate ranging from about 0.3 to about 3 ml/min.

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25.      The method according to claim 1, wherein the fluid is infused through the  
needle electrode a rate ranging from about 0.8 to about 2.5 ml/min.

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26.      The method according to claim 1, wherein the fluid is infused through the  
needle electrode a rate ranging from about 1 to about 2 ml/min.

10         27.     The method according to claim 1, wherein radiofrequency energy is  
introduced to the needle electrode at a power up to about 70 watts.

15         28.     The method according to claim 1, wherein radiofrequency energy is  
introduced to the needle electrode at a power ranging from about 20 to about 50 watts.

20         29.     The method according to claim 1, wherein radiofrequency energy is  
introduced to the needle electrode at a power ranging from about 30 to about 40 watts.

25         30.     The method according to claim 1, wherein radiofrequency energy is  
introduced to the needle electrode for at least about 15 seconds.

25         31.     The method according to claim 1, wherein radiofrequency energy is  
introduced to the needle electrode for at least about 30 seconds.

30         32.     The method according to claim 1, wherein radiofrequency energy is  
introduced to the needle electrode for at least about 60 seconds.

35         33.     The method according to claim 2, further comprising burning a surface lesion  
with a tip electrode on the catheter, wherein the surface lesion is burned at the endocardial  
surface of the tissue ablated with the needle electrode.

5           34.    The method according to claim 1, further comprising taking an impedance measurement using the needle electrode before, during and/or after introduction of the distal end of the needle electrode into the tissue.

10          35.    The method according to claim 34, further comprising adjusting the flow rate of the fluid infused through the needle electrode, an amount of power delivered to the needle electrode, and/or the time over which the fluid is infused and/or the power delivered in response to the impedance measurement.

15          36.    The method according to claim 1, further comprising measuring the temperature of the needle electrode during ablation.

20          37.    The method according to claim 36, further comprising adjusting the flow rate of the fluid infused through the needle electrode, an amount of power delivered to the needle electrode, and/or the time over which the fluid is infused and/or the power delivered in response to the temperature measurement.

25          38.    The method according to claim 37, wherein the needle electrode is maintained at a temperature ranging from about 35 to about 90°C.

30          39.    The method according to claim 37, wherein the needle electrode is maintained at a temperature ranging from about 45 to about 80°C.

35          40.    The method according to claim 37, wherein the needle electrode is maintained at a temperature ranging from about 55 to 70°C.

35          41.    The method according to claim 1, further comprising measuring electrical activity using the needle electrode before and/or after ablation.

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42.      The method according to claim 1, further comprising pacing using the needle electrode before and/or after ablation.

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43.      The method according to claim 1, wherein the needle electrode is retractable into the distal end of the catheter.

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